

Leeb Hardness Tester

LH210

User Manual





## **Preface**

Dear users:

Thank you for your purchase of our Leeb Hardness Tester of PRLH210 Series (it is called Hardness Tester below), the Hardness Tester is portable device, and it is equipped with printer and software for data processing. It is small in size, light in weight and easy to catch with. Before using the Hardness Tester you must read this User's Manual carefully, which could help you use this device correctly and we hope that it could open up to your satisfaction.

The Hardness Tester confirm to the following specifications:

Technical standards for Leeb Hardness Tester, JB/T 9378-2001

Transformation relation of different hardness scales, ISO 18265: 2003



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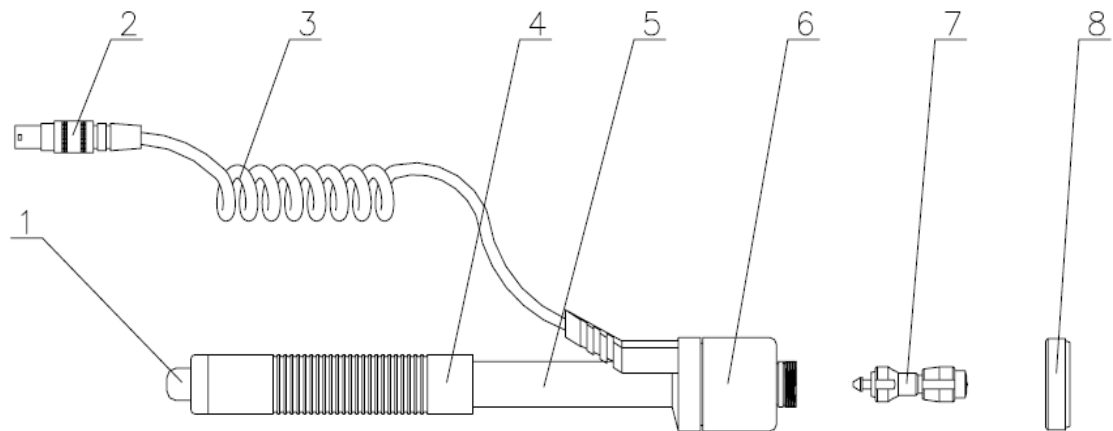
# 1 Structure Feature

## 1.1 The body



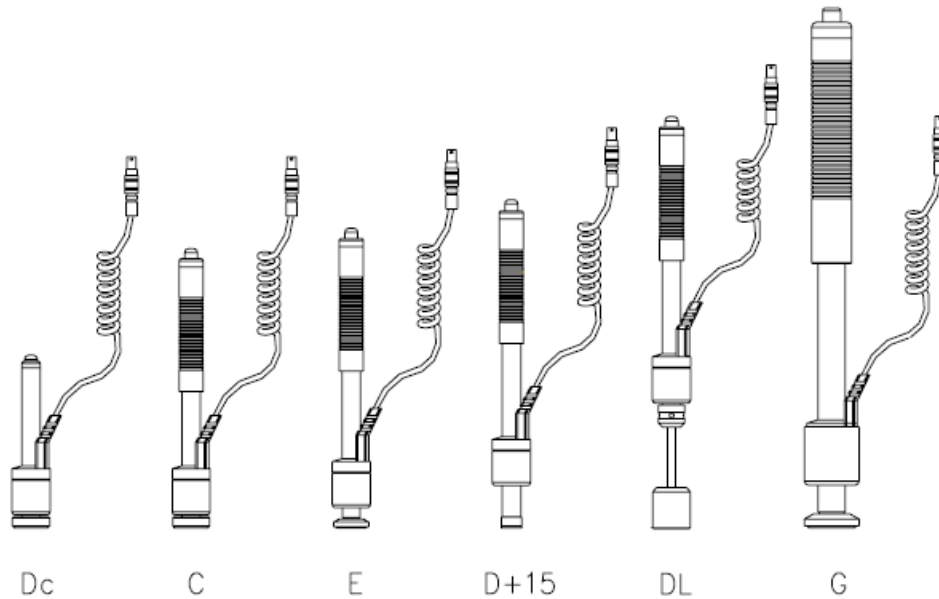
Front view

## 1.2 Impact device of type D



1. Release button    2.Plug of the impact device    3.Connection cable    4.Loading tube  
5.Guide tube    6.Coil unit    7. Impact body    8.Support ring

### 1.3 Some other types of impact device for purchasing





## 1.4 Technical Specifications

Error and repeatability of displayed value see Table 1.

Table 1

Type of impact device	DC(D)/DL	D+15	C	G	E
Impacting energy	11mJ	11mJ	2.7mJ	90mJ	11mJ
Mass of impact body	5.5g/7.2g	7.8g	3.0g	20.0g	5.5g
Test tip hardness:	1600HV	1600HV	1600HV	1600HV	5000HV
Dia. Test tip:	3mm	3mm	3mm	5mm	3mm
Material of test tip:	Tungsten carbide	Tungsten carbide	Tungsten carbide	Tungsten carbide	synthetic diamond
Impact device diameter:					
Impact device length:	20mm	20mm	20mm	30mm	20mm
Impact device weight:	75mm 50g	162mm 80g	141mm 75g	254mm 250g	155mm 80g
Max. hardness of sample	940HV	940HV	1000HV	650HB	1200HV
Mean roughness value of	1.6µm	1.6µm	0.4µm	6.3µm	1.6µm

sample surface Ra:						
Min. weight of sample:						
Measure directly		>5kg	>5kg	>1.5kg	>15kg	>5kg
Need support firmly		2 ~ 5kg	2 ~ 5kg	0.5 ~ 1.5kg	5 ~ 15kg	2 ~ 5kg
Need coupling tightly		0.05 ~ 2kg	0.05 ~ 2kg	0.02 ~ 0.5kg	0.5 ~ 5kg	0.05 ~ 2kg
Min. thickness of sample						
Coupling tightly		5mm	5mm	1mm	10mm	5mm
Min. layer thickness for surface hardening		≥0.8mm	≥0.8mm	≥0.2mm	≥1.2mm	≥0.8mm
Size of tip indentation						
Hardness 300HV	Indentation diameter	0.54mm	0.54mm	0.38mm	1.03mm	0.54mm
	Depth of indentation	24μm	24μm	12μm	53μm	24μm
Hardness	Indentation	0.54mm	0.54mm	0.32mm	0.90mm	0.54mm

600HV	diameter Depth of indentation	17μm	17μm	8μm	41μm	17μm
Hardness 800HV	Indentation diameter Depth of indentation	0.35mm 10μm	0.35mm 10μm	0.35mm 7μm	-- --	0.35mm 10μm
Available type of impact device		DC: Test hole or hollow cylindrical; DL: Test slender narrow groove or hole	D+15: Test groove or reentrant surface	C: Test small, light, thin parts and surface of hardened layer	G: Test large, thick, heavy and rough surface steel	E: Test super high hardness material

## 2 Overview

### 2.1 Features

- Ultra-thin shell, more easily to hold
- Suitable for multiple impact device and 6 types of hardness scales are available for various applications
- Large and clear digital display
- Rechargeable lithium ion battery , support USB charging
- Optional PC software with perfect data base function. Supporting data query, system characteristics displaying and bar graph displaying

### 2.2 Technical Specification :

- **Hardness Scales** : HL、 HRC、 HRB、 HV、 HB、 HS
- **Test Precision** : HLD :  $\pm 6$       HRC :  $\pm 1$       HB :  $\pm 4$
- **Standard Impact Device**: impact device of Type D
- **Upper / Lower Limits Setting** : (170-960)HLD, (17.9-69.5)HRC, (19-683)HB, (80-1042)HV, (30.6-102.6)HS, (13.5-101.7)HRB
- **Optional Impact Device**: D/ C /DC / D+15 / DL/ G
- **Number of Impact Devices Equipped With One Time**: any

- **PC Interface:** USB 2.0
- **Language :** Chinese
- **Screen Display:** 128X64 dot matrix LCD, backlight and adjustable contrast
- **Measuring Direction :** 360° ( down, inclined down, level,inclined up and up )
- **Data Memory :** 200 readings
- **Maximum Hardness of The Measured Work Piece:** 940HV ( for D,DC,DL,D+15,C impact device )
- **Radius of Rurvature of The Measured Work:** Rmin=50mm ( If using Alien supporting ring, Rmin=10mm )
- **Recognition Function :** Recognize the type of the impact device by itself
- **Measurable Material :** Steel and cast steel, alloy tool steel, stainless steel, gray cast iron, nodular cast iron, aluminum casting alloy, copper zinc alloy(brass), copper tin alloy(bronze), fine copper
- **Power Supply:** 1.5V battery ( 3 PCS)
- **Working time:** about 150 hours
- **Shape Size:** 155mm\*68mm\*27mm
- **Weight:** 230g

### 2.3 Main function parameter

- ◆ Choose Testing Materials, Hardness Scales, Measuring Direction and times of Tests By Button;
- ◆ Direct Display of Hardness Scales including HRB, HRC, HV, HB, HS, HL;
- ◆ Show the Result of Each Test Repeated, Automatically or Manually Remove the Wrong Test Results;
- ◆ Directly Output the Average Single Test Result or All the Results In One Time;
- ◆ Automatic detection of the Battery Voltage, Low Voltage Warning for Battery protection, with Battery Indicating Icon in Test Status;
- ◆ Plenty of Status Bar Display, Displaying Bluetooth, Buzzer, Error Information, Time, Battery Quantity and so on;
- ◆ Ambient temperature : Operating temperature - 10 ~ + 50°C;
- ◆ Storage temperature : -30°C ~ + 60°C.

## 2.6 Testing and measurement range

Table 2 Measurement range

Material	Method	Impact device					
		D/DC	D+15	C	G	E	DL
Steel and cast steel	HRC	17.9 ~ 68.5	19.3 ~ 67.9	20.0 ~ 69.5		22.4 ~ 70.7	20.6 ~ 68.2
	HRB	59.6 ~ 99.6			47.7 ~ 99.9		37.0 ~ 99.9
	HRA	59.1 ~ 85.8				61.7 ~ 88.0	
	HB	127 ~ 651	80 ~ 638	80 ~ 683	90 ~ 646	83 ~ 663	81 ~ 646
	HV	83 ~ 976	80 ~ 937	80 ~ 996		84 ~ 1042	80 ~ 950
	HS	32.2 ~ 99.5	33.3 ~ 99.3	31.8 ~ 102.1		35.8 ~ 102.6	30.6 ~ 96.8
Steel	HB	143 ~ 650					
CWT、ST	HRC	20.4 ~ 67.1	19.8 ~ 68.2	20.7 ~ 68.2		22.6 ~ 70.2	
	HV	80 ~ 898	80 ~ 935	100 ~ 941		82 ~ 1009	
Stainless	HRB	46.5 ~					

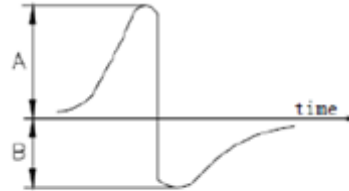
steel		101.7					
	HB	85 ~ 655					
	HV	85 ~ 802					
GC. IRON	HRC						
	HB	93 ~ 334			92 ~ 326		
	HV						
NC. IRON	HRC						
	HB	131 ~ 387			127 ~ 364		
	HV						
C . ALUM	HB	19 ~ 164		23 ~ 210	32 ~ 168		
	HRB	23.8 ~ 84.6		22.7 ~ 85.0	23.8 ~ 85.5		
BRASS	HB	40 ~ 173					
	HRB	13.5 ~ 95.3					
BRONZE	HB	60 ~ 290					
COPPER	HB	45 ~ 315					

## 2.7 Leeb Hardness Testing Principle

The basic principle is: use an impact body of certain weight impacts against the testing surface under certain test force, then measure the impacting velocity and the rebounding



velocity of the impact body respectively when the spherically test tip is located 1mm above the testing surface.



Output signal of impact device

The calculation formula is as follows:

$$HL=1000 \times VB / VA$$

Where, HL—— Leeb hardness value

VB—— Rebounding velocity of the impact body

VA—— Impacting velocity of the impact body

## **3 Preparation & Testing**

### **3.1 Preparation & Inspection before Testing**

#### **3.1.1 Preparation of Sample Surface**

Preparation for sample surface should conform to the relative requirement in the Table 3.

(1) In the preparation processing for sample surface, the hardness effect of being heated or cold processing on the surface of sample should be avoided.

(2) Too big roughness of the being measured surface could cause measure error. So the surface of the sample to be measured must appear metallic luster, smoothing and polish, without oil stain.

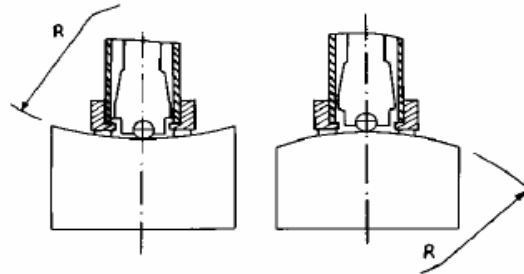
(3) Support of test sample. Support is not necessary for heavy sample. Medium weight parts must be set on the smoothing and stable plane. The sample must set absolutely equability and without any wobble.

(4) The sample should have enough thickness, and minimum thickness of sample should conform to Table 3.

(5) For the sample with hardened layer on surface, the depth of hardened layer should conform to Table 3.

(6) Curved surface: The best testing surface of sample is flat. When the curvature radius  $R$  of the surface to be tested is smaller than 30mm (D, DC, D+15, C, E and DL type of

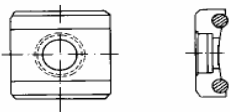
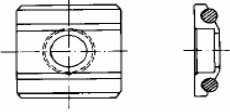
impact device) and smaller than 50mm (G type of impact device), the small support ring or the shaped support rings should be chosen.

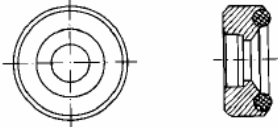
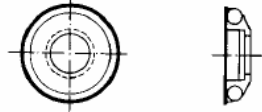
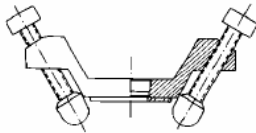


(7) Coupling. Light-weight sample must be firmly coupled with a heavy base plate. Both coupled surface must be flat and smooth, and there is no redundant coupling agent existing. The impact direction must be vertical to the coupled surface. When the sample is a big plate, long rod or bending piece, it can be deformed and become unstable, even though its weight and thickness is big enough, and accordingly, the test value may not be accurate. So the sample should be reinforced or supported at its back.

(8) Magnetism of the sample itself should be avoided.

Table 3

No.	Type	Sketch of non-conventional Supporting ring	Remarks
1	Z10-15		For testing cylindrical outside surface R10 ~ R15
2	Z14.5-30		For testing cylindrical outside surface R14.5 ~ R30
3	Z25-50		For testing cylindrical outside surface R25 ~ R50
4	HZ11-13		For testing cylindrical inside surface R11 ~ R13
5	HZ12.5-17		For testing cylindrical inside surface R12.5 ~ R17
6	HZ16.5-30		For testing cylindrical inside surface R16.5 ~ R30

7	K10-15		For testing spherical outside surface SR10 ~ SR15
8	K14.5-30		For testing spherical outside surface SR14.5 ~ SR30
9	HK11-13		For testing spherical inside surface SR11 ~ SR13
10	HK12.5-17		For testing spherical inside surface SR12.5 ~ SR17
11	HK16.5-30		For testing spherical inside surface SR16.5 ~ SR30
12	UN		For testing cylindrical outside surface, radius adjustable R10 ~ $\infty$

### 3.1.2 System Setting

See 5.2 for details.

### 3.1.3 Presetting Testing condition

See 5.5 for details.

## 3.2 Testing Program

Verification of the tester is by using standard test block. The error and repeatability of displayed value should be within the regulation of table 4.

**Note** : Use a calibrated hardness tester, test the standard test block downward vertically for 5 times, the arithmetical average value compare with the value of standard test block. If this value exceeds the standard value, could use the function of software calibration to adjusting.

### 3.2.1 Start-Up


- (1) Insert the plug of the impact device into the socket of impact device on the tester.
- (2) Press  key , now power is connected. The instrument is in testing condition.

Table 4:

No.	Material	HLD	Strength $\sigma_b$ (MPa)
1	Mild steel	350 ~ 522	374 ~ 780
2	High-Carbon steel	500 ~ 710	737 ~ 1670
3	Cr steel	500 ~ 730	707 ~ 1829
4	Cr-V steel	500 ~ 750	704 ~ 1980
5	Cr-Ni steel	500 ~ 750	763 ~ 2007
6	Cr-Mo steel	500 ~ 738	721 ~ 1875
7	Cr-Ni-Mo steel	540 ~ 738	844 ~ 1933
8	Cr-Mn-Si steel	500 ~ 750	755 ~ 1993
9	Super strength steel	630 ~ 800	1180 ~ 2652
10	Stainless steel	500 ~ 710	703 ~ 1676

### 3.2.2 Loading

Pushing the loading-tube downwards until contact is felt. Then allow it to slowly return to the starting position or using other method locking the impact body.

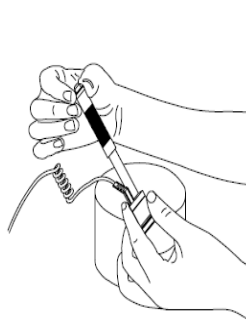


Chart 1

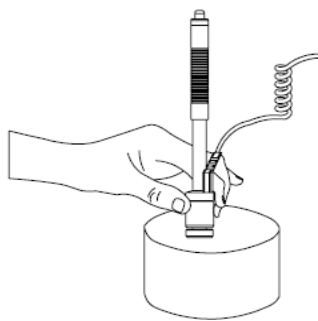


Chart 2

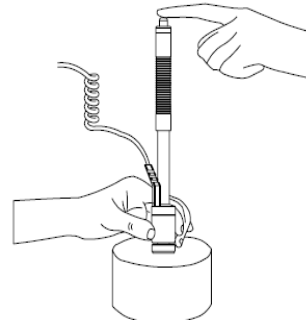


Chart 3

### 3.2.3 Localization

Press the impact device supporting ring on the surface of the sample firmly, and the impact direction should be vertical to the testing surface.

### 3.2.4 Testing

(1) Press the release button on the upside of the impact device to test. The sample and the impact device as well as the operator are all required to be stable now.



The action direction should pass the axis of the impact device.

(2) Each measure area of the sample usually need 5 times of testing operation. The result data dispersion should not more than mean value $\pm 15HL$ .

(3) The distance between any two impact points or from the center of any impact point to the edge of testing sample should conform to the regulation of Table 5.

Table 5

Type of Impact Device	Distance of center of the two indentations	Distance of center of the indentation to sample edge
	Not less than (mm)	Not less than (mm)
D、DC	3	5
DL	3	5
D+15	3	5
G	4	8
E	3	5
C	2	4

(4) If you want accurate conversion from the Leeb hardness value to other hardness value, contrastive test is needed to get conversion relations for the special material. Use inspection qualified Leeb hardness tester and corresponding hardness tester to test at the same sample respectively. For each hardness value, each measure homogeneously 5 points of Leeb hardness value in the surrounding of more than three indentations which need conversion hardness, using Leeb hardness arithmetic average value and corresponding hardness average value as correlative value respectively, make individual hardness contrastive curve. Contrastive curve at least should include three group of correlative data.

### **3.2.5 Read measured value**

The measured value displays in the area of measured value after each measurement and the times will increase 1. But if the measured value is like as "EX", which means that the measured value is out of range and the times would keep what it is.

Every Specific "EX":

"E1" means that the impact direction is wrong

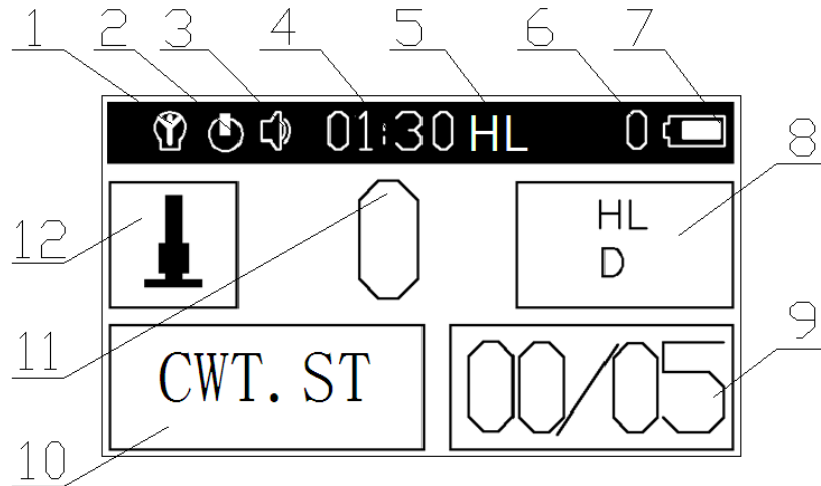
"E2" means that there is no transformation between HL and other current hardness scale

"E3" means that the measured value is too large

"E4" means that the measured value is too small

"E5" means wrong operation

#### 4 Operation in Details











- 1.LCD Backlight   2. Standby time   3.Silent mode   4.Time display   5. Sign of HL  
6. Measure value by HL   7. Battery status   8. Hardness Scale   9.Times  
10.Material   11. Measure value   12. Impact direction



Diagrams of the keyboard

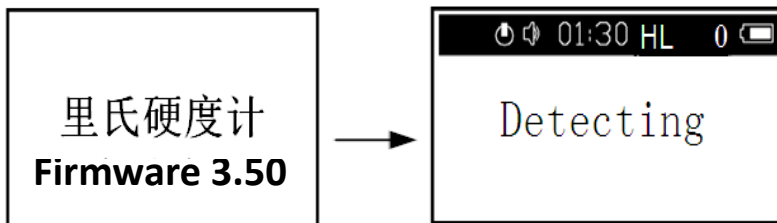
Function of the keys:

-  Power on/off and LCD brightness on/off.

-  MENU/Enter
-  Cancel or Escape.
-  Direction.
-  Material.
-  Scale.
-  Upward/Save
-  Downward/Delete
-  Left/Right.

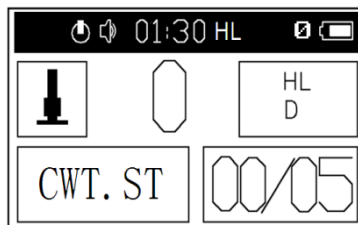
#### **4.1 Power on**

Plug in the impact device, and press  to power on the system. The screen shows as below:






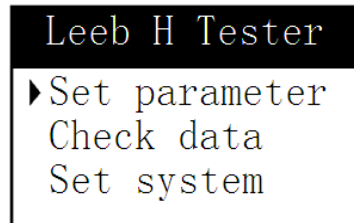
The system would automatically detect the type of the impact device during power up and would display this information on the screen as below.





Following is the main display interface as below.

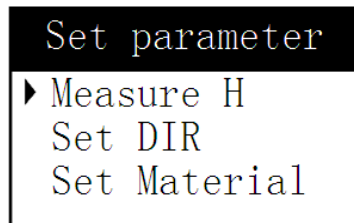


## 4.2 Test Set




Press  at the main interface to enter the main menu—Leeb H Tester, as below.  
Press key  or  could continuously glance downward or upward.



Press  to enter menu "Set parameter". Press key  or  to move the cursor to the line you want to set, and press key  to enter submenu.



#### 4.2.1 Hard/ $\sigma$ setting







Press key  or  to move the cursor to the line of "Measure H", and then press key  to switch **H/TS** continuously.

**Note : 1. H is short for Hardness and TS is short for strength.**

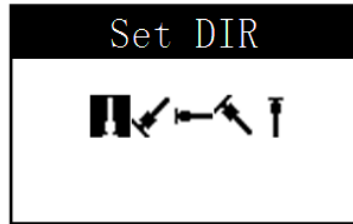
**2. When H/TS is switched to TS, the hardness scale could not be selected.**

**3. Only D type of impact device has the function of TS measure. So the impact device could not be selected.**

#### 4.2.2 Impact Direction Setting

Press key  or  to move the cursor to the line of "Set DIR", and press key  to enter submenu "Set DIR", and then press key  or  to choose one of the five kinds of impact direction such as downward, upward, downward 45°, upward 45° and level 180° as below. After setting up correctly, press key  to confirm it and return submenu "Set parameter".





### Set impact direction using shortcut key:

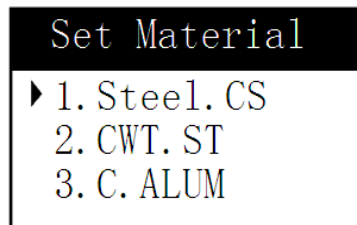
Press key **DIRECTION** in main interface to change times quickly.

### 4.2.3 Material Setting

When **H/TS** is preset to hardness, it will display the following material: Steel and Cast Steel、Cold Work Tool Steel、Stainless Steel、Gray Cast Iron、Nodular Cast Iron、Cast Aluminum Alloys、Copper-Zinc Alloys、Copper-Aluminum Alloys、Wrought Copper and Wrought Steel. And when **H/TS** is preset to 6b, it will display the following material: Mild Steel、High-Carbon Steel、Cr Steel、Cr-V Steel、Cr-Ni Steel、Cr-Mo Steel、Cr-Ni-Mo Steel、Cr-Mn-Si Steel、Super Strength Steel and Stainless Steel.

Enter submenu "Set Material", and then press key  or  to move the cursor to the



material you want to preset. Press key  to confirm it and return submenu "Set parameter" as below.

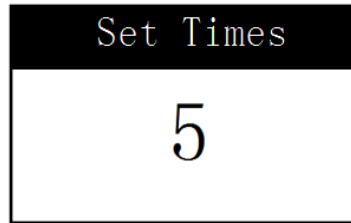



#### **Set material using shortcut key:**

Press key  in main interface to change times quickly.


#### **4.2.4 Average Times Setting**

Enter submenu "Set Times", and then press key  or  to set the times you want to preset as below.






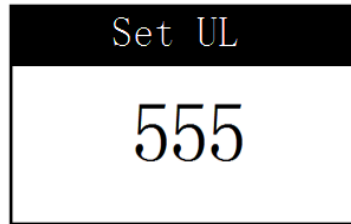
Press key  to confirm it and return submenu "Set parameter".

#### **Set times using shortcut key:**

Press key  in main interface to change times quickly.

#### **4.2.5 Tolerance Limit Setting**

Enter submenu "Set UL", and then press key  to move the cursor and press key  or  to change the number as below.





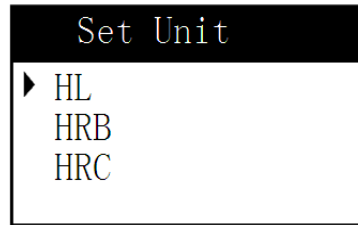
Press key  to confirm it and return submenu "Set parameter".

**NOTE:1. UL is short for up limit and LL is short for lower limit.**

**2. Set LL is the same with UL.**


#### **4.2.6 Hardness Scale Setting**

Enter submenu "Set Unit", and then press key  or  to move the cursor to the hardness scale you want to preset , as below.





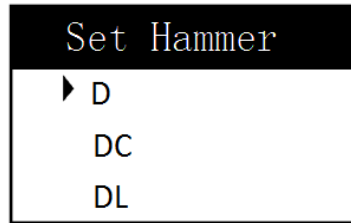
Press key  to confirm it and return submenu "Set parameter".

#### **Set hardness scale using shortcut key:**

Press key  in main interface to change hardness scale quickly.

#### **4.2.7 Impact device setting**

Enter submenu "Set Hammer", and then press key  or  to move the cursor to the impact device you want to preset, as below.



Press key  to confirm it and return submenu "Set parameter".



**NOTICE: When the "AVE" mark is displayed on the screen, it is invalid to use shortcut key to change parameters. At this time, saving the old result in order to start a new setup is necessary.**


### 4.3 Testing

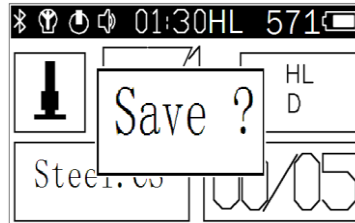
See chapter 3 for details

### 4.4 Save and Print the data





#### 4.4.1 Save the data

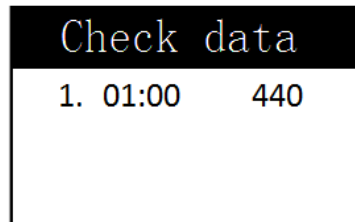
After finishing the test, press key  to save the data ,then press key  to




confirm it or press key  to cancel it.



#### 4.4.2 Check the data

Press key  to return to the main menu "Leeb H Tester". Now press key  or  to move the cursor to the line of "Check data", and then press key  to enter submenu "Check data" where you can check the data we have saved as below.






Press  or  to move the cursor to the line which you want to see details, the press key  to check the detail information of the data as below.

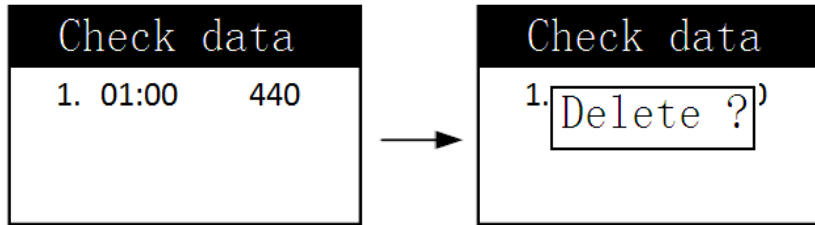
MAX	:552
MIN	:496
ANOV	:2315
AVG	:534

Press the key  to turn the page to check all of the information.





#### **4.4.3 Delete the data**

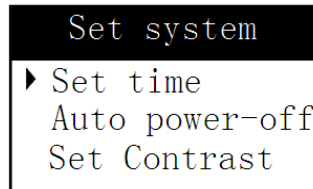
Enter submenu" Check data", and press key  to delete the data, then press key  to confirm it or press key  to cancel it as below.








## 4.5 System set





Press the key  to return to the main menu "Leeb H Tester". Now press key  or  to move the cursor to the line of "Set system" , and then press key  to enter submenu "Set system" as below.






### 4.5.1 Time data set

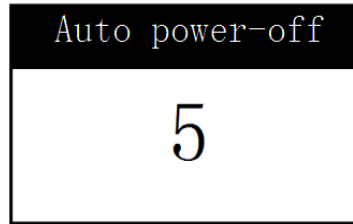
Press key  or  to move the cursor to the line of "Set time" , and press key  to enter submenu" Set time" as below.





Set time	
22: 58	
WK	SUN
11 Y	01 M 01 D

Press key  to move the cursor and press key  or  to change the NO. Press key  to confirm it and return submenu" Set system ".




#### 4.5.2 Auto power-off

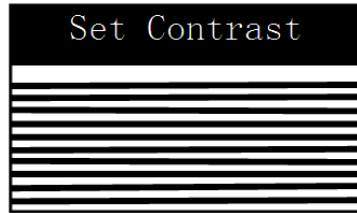
Press key  or  to move the cursor to the line of "Auto power-off" , and press key  to enter submenu" Auto power-off" as below.






Press key  or  to change the standby time. For example, the digital 1 indicates the standby time is 1 second and the maximum standby time is 10 seconds, while NO.0 indicates standby time is infinite. The Sign  shows in the screen when the number is not 0. Press key  to confirm it and return submenu "Set system".




#### **4.5.3 LCD brightness set**

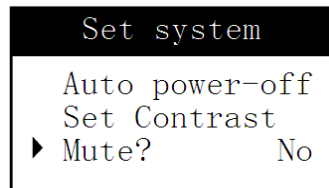
Press key  or  to move the cursor to the line of "Set Contrast", and press key  to enter submenu "Set Contrast" as below.



Press key  or  to change the LCD brightness. Press key  to confirm it and return submenu "Set system" .

#### 4.5.4 Silent mode set

Press key  or  to move the cursor to the line of "Mute? No" and then press key  to switch on/off the silent mode continuously as below.



If the silent mode is off, the sign in the screen is  or it is 

## **5 Servicing & Maintenance**

### **5.1 Impact Device Servicing**

1) After the impact device has been used for 1000--2000 times, please use the nylon brush provided to clean the guide tube and impact body. When cleaning the guide tube, unscrew the support ring first, then take out the impact body, spiral the nylon brush in counter-clock direction into the bottom of guide tube and take it out for 5-6 times, and then install the impact body and support ring again.

2) Release the impact body after use.


3) Any lubricant is absolutely prohibited inside the impact device.

### **5.2 Normal Maintenance Program**

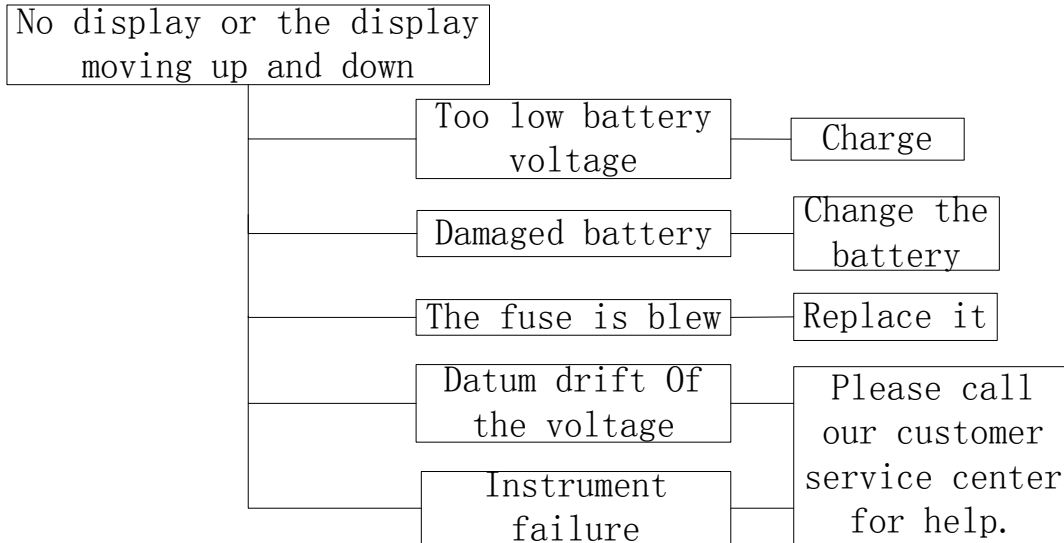
When using standard Rockwell hardness block to testing, if all the error is bigger than 2 HRC, it may be the invalidation of impacted ball top caused by abrasion. Changing the spherical test tip or impact object should be considered.

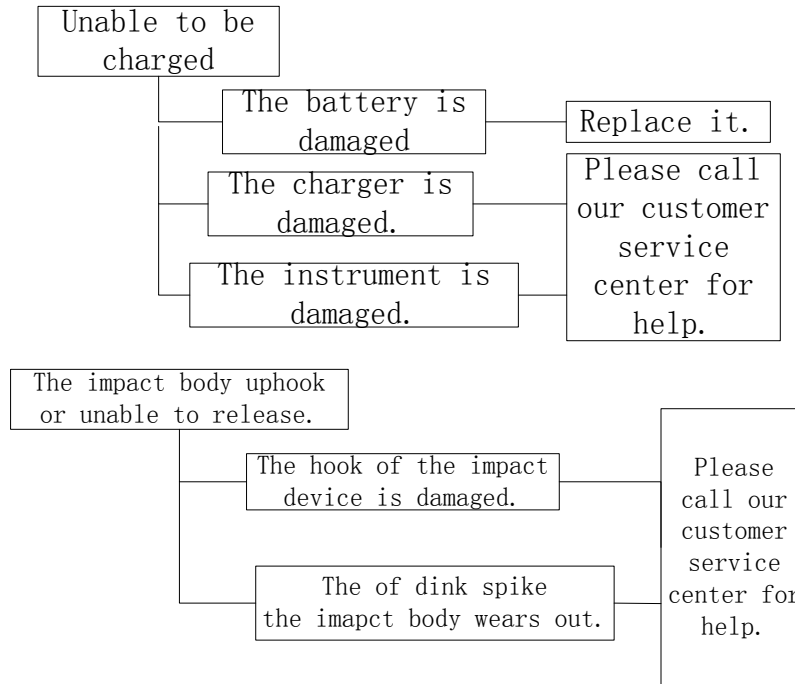
When the hardness tester appears some other abnormal phenomena, please do not dismantle or adjust any fixedly assembled parts. Fill in and present the warranty card to us. The warranty service can be carried on.

### **5.3 The battery**

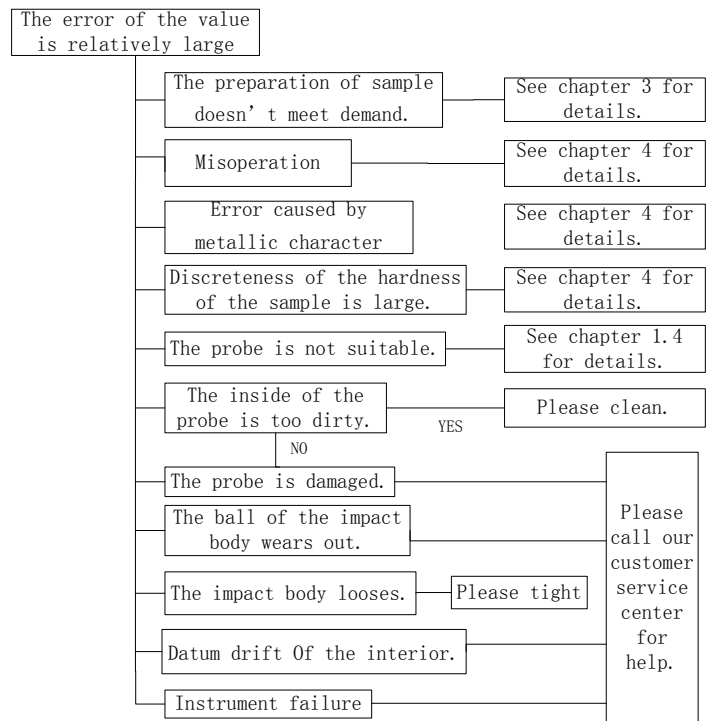
- 1) Press  to power off the system ,and open up the back cover to take out the battery.
- 2) Remove the battery when not using the instrument for long time, in order to avoid battery leakage and corrosion the instrument.

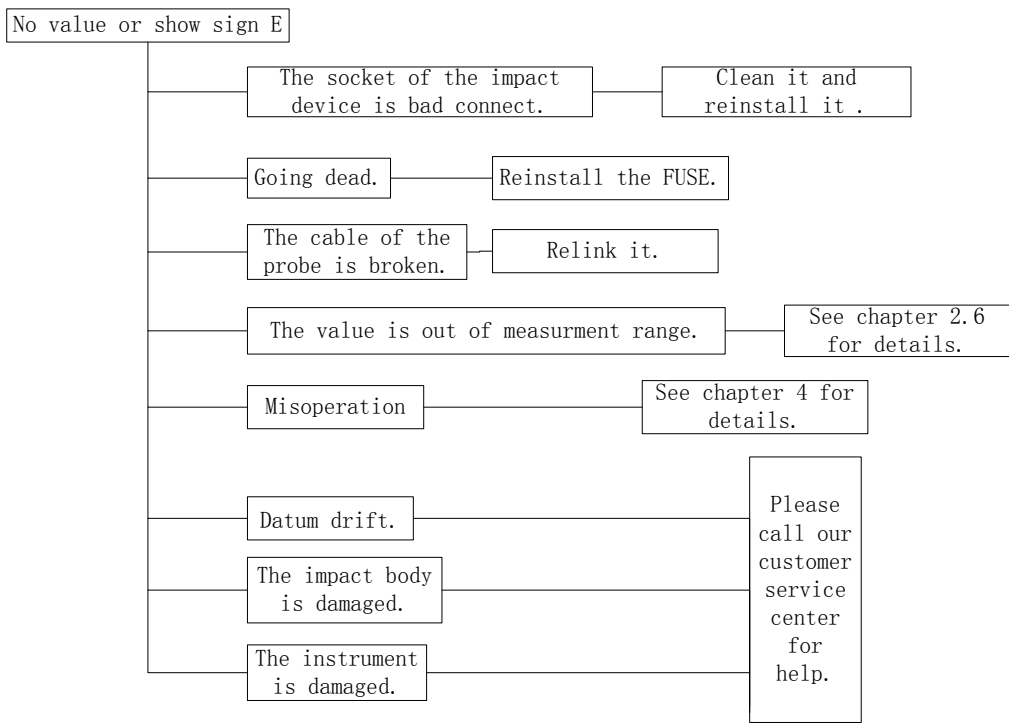
## 6 Malfunction analysis and maintenance

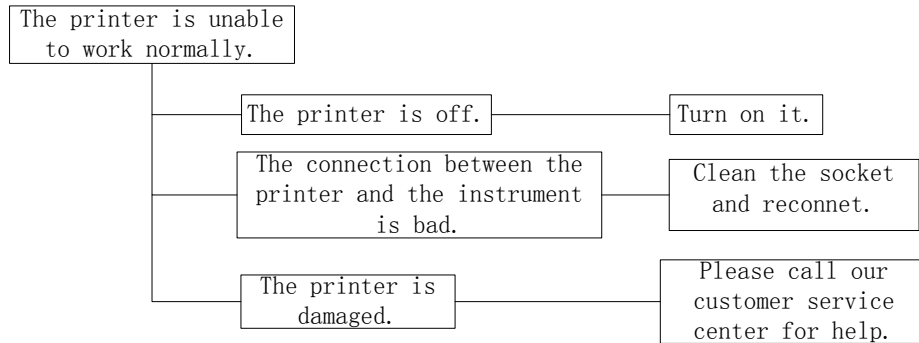












<1> When using standard Rockwell hardness block to testing, if all the error is bigger than 2HRC, it may be the invalidation of impacted ball top caused by abrasion. Changing the spherical test tip or impact object should be considered.

<2>When the hardness tester appears some other abnormal phenomena, please do not dismantle or adjust any fixedly assembled parts. Fill in and present the warranty card to us. The warranty service can be carried on.

## **7 List of components not warranty**

1 the shell 2 the printer cover 3 the panel 4the impact body 5the support ring 6 the probe cable 7 ink ribbon 8 the battery(the damage caused by faulty operation problem)

## **8 Instructions for Standard Leeb Hardness Test Specimen**

The Standard Leeb Hardness Test Specimen is a new standard instrument of measurement for hardness measurement used for periodic calibration or daily calibration for the Leeb Tester and the standard have delivered the Leeb Hardness magnitude Since April 1, 2004. We'll give a brief description of the standard to make you know and use it correctly. The rule for the error of indication and the repeatability of indication of the Leeb Hardness value is listed in table 7, the rule made by the national metrological verification regulations (JJG747-1999) in table 7 is suitable for Leeb Hardness Tester of new, in use and having been repaired.

Error of displayed value:  $\delta = \text{HLD} - \text{HLD}$

In the formula, HLD represents for the average of five measurement values, HLD represents for the hardness value of Standard Leeb Hardness Test Specimen.

Repeatability of displayed value:  $b = \text{HLD}_{\text{max}} - \text{HLD}_{\text{min}}$

In the formula, HLD<sub>max</sub> represents for the maximum value of the five measurement values,

HLD<sub>min</sub> represents for the minimum value of the five measurement values. The HLD in the two formulas above can also be HLDC, HL(D+15), HLC, HLG and HLE.

Table7: Error and repeatability of displayed value

NO.	Type of impact device	Hardness value of Leeb standard hardness block	Error of displayed value	repeatability of displayed value
1	D	760±30HLD 530±40HLD	±6 HLD ±10 HLD	6 HLD 10 HLD
2	DC	760±30HLDC 530±40HLDC	±6 HLDC ±10 HLDC	6 HLDC 10 HLDC
3	DL	878±30HLDL 736±40HLDL	±12 HLDL	12 HLDL
4	D+15	766±30HLD+15 544±40HLD+15	±12 HLD+15	12 HLD+15
5	G	590±40HLG 500±40HLG	±12 HLG	12 HLG
6	E	725±30HLE 508±40HLE	±12 HLE	12 HLE
7	C	822±30HLC 590±40HLC	±12 HLC	12 HLC

## **Users Notice**

1. Please fill out the warranty registration card seriously and seal your Company Chop after you get the instrument. Then mail the copies of the warranty registration card and the invoice to our user service center or you can relegate that to the seller when buying the instrument.
2. If it go wrong for quality matter within a year after you buy our instruments, please take your warranty registration car and invoice to our repair station nearby for repairing, changing or returning. If you can't show the warranty registration card and the invoice we would calculate the warranty period since the instruments are produced, and the warranty period is one year.
3. If it is out of the warranty period, the repair stations are response for after service and repairing and charge according to the rules of our company.
4. You need to pay for additional configuration, such as the software.
5. If transportation, installation, faulty operation problem, lead to the equipment's part damage. The damages caused by transportation, installation, faulty operation, non-professional maintenance are out of warranty service. If you alter the warranty registration car or there is no invoice, we wouldn't provide free repair.

